

Explanation

- SLUMP OR SLIDE STRUCTURES
High resolution seismic profiles show discontinuous reflectors which are interpreted to be slump or slide related
- POTENTIAL SLUMP OR SLIDE AREAS
High resolution seismic profiles show thick sediment (>25m) on relatively steep slopes (>1-8°)
- NEAR SURFACE OR SURFACE FAULTS
- 200 METRE ISOBATH
- SEISMIC PROFILE LINES SHOWN AS INSETS

In the northern Gulf of Alaska, all but one loading of the near continental shelf (NCS) is proposed in the very near future (Beebe, 1975). Because the region is subject to intense seismic activity (Frey, 1975), it seems likely to delineate areas of the NCS which are susceptible to potential landslides from ground shaking, fault displacement or ground failure. Therefore the purpose of this map is to provide: (1) preliminary information on areas of present and potential submarine slides and/or slumps and, (2) approximate locations of nearsurface faults.

Data Collection

The data used for this map were collected on the September-October, 1974, cruise of the R/V THOMAS G. THOMPSON (von Hanne and others, 1975). These data include three types of continuous seismic profiles (lines A, B, and C) using a sound source a 3.5 kHz transducer, two minisparker 1000 foot and two 40' air guns. Several types of navigation equipment were used because of intermittent power and equipment failures: the instruments included Decca B, Fix, Hattisley, Loran A and Radar.

Nearsurface Faults

The traces of the nearsurface and surface faults were interpreted largely from minisparker records (lines A and C) along and 3.5 km records were used as additional aids.

In most cases the faults cut strata which are similar to and may be equivalent to the upper Tertiary formation (line B) which (Frazier, 1967) indicates is middle Miocene to lower Pliocene sediment (line C) and in many places crop out at the seafloor (line B). A few of the faults appear to cut Holocene sediments (line C). Additional interpretation of the age and sense of motion for these faults will not be attempted here—further study is needed.

The nearsurface faults we have thus far detected occur in four main parts of the NCS area: (1) south of Cape Sabine, (2) on or adjacent to the Hayes Island platform, (3) on Tarr Bank and (4) near Middleton Island.

Slides and Potential Slides or Slumps

Seismic profiles from two parts of the map area show disrupted bedding and irregular topographic expression commonly associated with submarine slides or slumps (lines D and E). The slumped section south of Icy Bay and southeast of the Malaspina Glacier (line D) is 1700 m in surface area, has a gradual slope of less than 1/3°, but is in an area of thick Holocene sediment (>150 m).

Similarly the second area where slide structures were seen in the seismic records, an area of about 1700 m² along the Copper River delta, the slope is gentle (1/2°), but a thick wedge of Holocene sediment (>200 m) has accumulated rapidly. According to Norgenstrom (1975), in regions with high rates of sedimentation such as deltas, the lag between accumulation and consolidation gives rise to excess pore pressure and the addition of this water-saturated sediment material is prone to slumping. The Copper River prodelta was investigated with the profiles shown by Beemer (1973) shortly after the 1964 Alaska earthquake. He attributed the slump structures visible in the upper part of the section to this earthquake. These slump structures are similar in size and shape to the slump structures visible on our profiles over this same area (line E).

Acoustic profiles show a massive submarine slide at the east edge of the Copper River (line E). This 17 km long slide which has a volume of about 5.5 x 10¹² m³ (Carlson and Molnia, 1975) moved down a slope of about the same to the bottom of Kayak Trough. Indirect evidence collected from the upper part of this slide consist of a structureless, gray silty clay of extremely low strength (laboratory tests with a core shear yielded a peak shear strength of ~22 kg/cm²).

The areas on the map indicated as potential slides or slump areas were delineated based on thicknesses of Holocene sediment and relative steepness of slopes. Slump or slide structures were not present on the profiles; however, because of the sediment thickness (>25 m) and slope steepness (>1-8°) there is a possibility of ground failure in these areas if a large earthquake provides rapid ground acceleration or if a large amount of storm wave disrupts the seafloor. Such catastrophic events were experienced by many communities in the Prince William Sound region and along the shoreline of the Gulf of Alaska during the 1964 Alaska earthquake (Grout and others, 1964; Coulter and Higginson, 1964; and Frazier and others, 1965).

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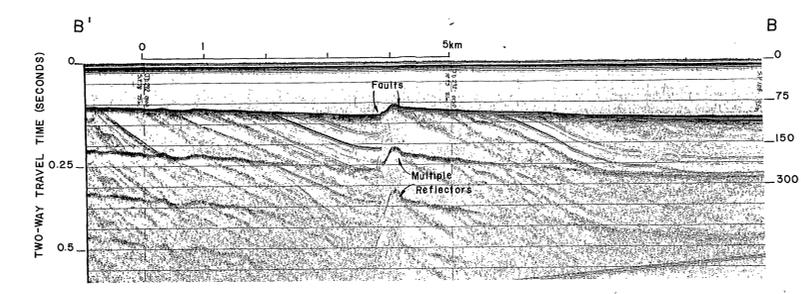
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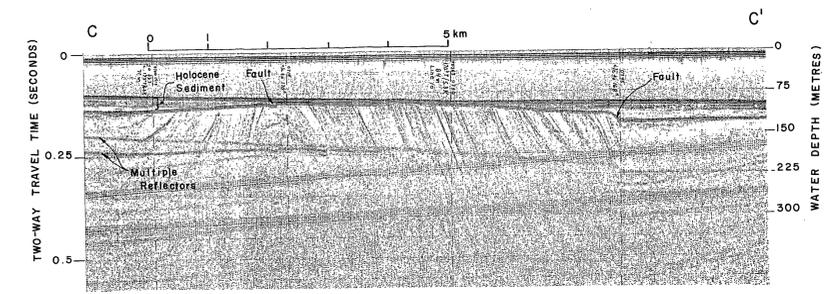
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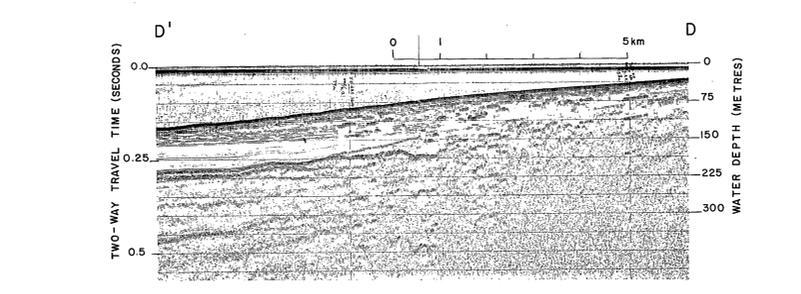
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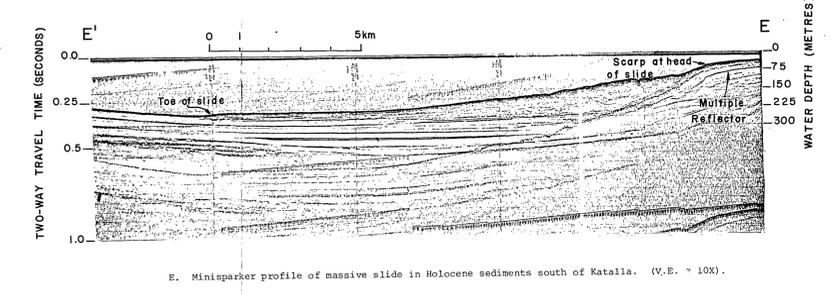
B. Minisparker profile showing older faulted and folded strata (Tertiary-Pleistocene) cropping out at the seafloor. (Vertical Exaggeration (V.E.) = 10X).



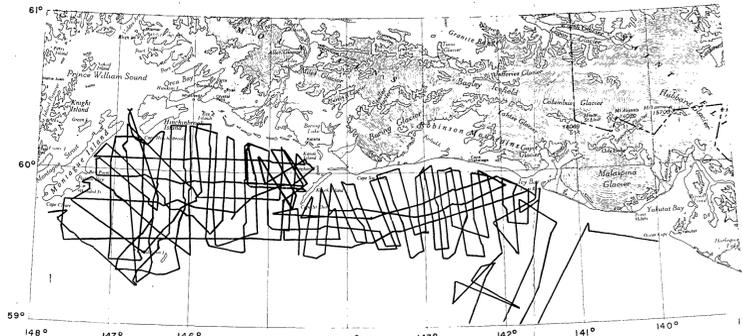
C. Minisparker profile south of Cape Yakutat showing older faulted and folded strata (Tertiary-Pleistocene?) overlain by thin blankets of Holocene sediment. (V.E. = 10X).



D. Minisparker profile showing slump structures (disrupted reflectors) in Copper River prodelta sediments. (V.E. = 10X).



E. Minisparker profile of massive slide in Holocene sediments south of Katalla. (V.E. = 10X).



A. Index of seismic reflection lines.

This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey standards and nomenclature.

SUBMARINE SLIDES AND NEARSURFACE FAULTS, NORTHERN GULF OF ALASKA

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